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PATENT

Docket No. JCLA6009

Date: 10-23-2000

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ATTENTION: APPLICATION BRANCH

Sir:

Transmitted herewith for filing is the patent application of

Inventor: Chun-Yang Hsiao; Shui-Po Ho

For: ULTRASONIC SIGNALING INTERACTIVE TOY

Enclosed are:

- (x) Specification 12 pages.
- (x) 7 Sheets of drawings
- (x) Recordation Form Cover sheet with 2 pages assignment.
- () A certified copy of Taiwan Patent Application No. _____ dated _____.
- (x) **SIGNED** declaration and power of attorney.
- (x) Verified statement (Declaration) claiming small entity status.
- (x) Return Prepaid postcard.

CLAIMS AS FILED

FOR	NUMBER FILED	NUMBER EXTRA	RATE	FEE
Basic Fee			\$355	\$ 355
Total Claims	12	-20 =0 x	\$9	\$ 0
Independent Claims	1	-3 =0 x	\$40	\$ 0
If application contains any multiple dependent claim (s), then add			\$135	\$ 0
TOTAL FILING FEE				\$ 355

- (x) A check in the amount of \$355 cover the filing fee is enclosed.
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Jiawei Huang

Registration No. 43,330

Applicant or Patentee: Elan Microelectronics Corp.
Serial or Patent No.: _____
Filed or Issued: _____
Title: ULTRASONIC SIGNALING INTERACTIVE TOY

Attorney's Docket No.: _____

**VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS
(37 CFR 1.9(f) & 1.27(c))-SMALL BUSINESS CONCERN**

I hereby declare that I am

☐ the owner of the small business concern identified below:

☐ an official of the small business empowered to act on behalf of the concern identified below:

NAME OF SMALL BUSINESS CONCERN Elan Microelectronics Corp.

ADDRESS OF SMALL CONCERN 7F-1, No. 9, Chan-Yeh I Rd., Science-Based Industrial Park, Hsinchu, Taiwan, R.O.C.

I hereby declare that the above identified small business concern qualifies as a small business concern as defined in 13 CFR 121.3-18, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees to the United States Patent and Trademark Office, in that the number of employees of the business concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention, entitled ULTRASONIC SIGNALING INTERACTIVE TOY

by inventor(s) (1) Chun-Yang Hsiao (2) Shui-Po Ho
described in _____

☐ the specification filed herewith

☐ application serial no. _____, filed _____

☐ patent no. _____, issued _____

If the rights held by the above identified small business concern are not exclusive, each individual, concern or organization having rights in the invention listed below* and no rights to the invention are held by any person, other than the inventor, who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person made the invention, or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d), or a nonprofit organization under 37 CFR 1.9(e). *NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities (37 CFR 1.27)

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I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

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TITLE OF PERSON IF OTHER THAN OWNER Representative

ADDRESS OF PERSON SIGNING 7F-1, No. 9, Chan-Yeh I Rd., Science-Based Industrial Park, Hsinchu, Taiwan, R.O.C.

SIGNATURE _____

DATE 4/10/00

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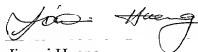
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Docket No. : JCLA 6009
Applicant(s) : Chun-Yang Hsiao; Shui-Po Ho
For : ULTRASONIC SIGNALING
INTERACTIVE TOY
"Express Mail" : EL 609897754 US
Mailing Label No.
Date of Deposit : October 23, 2000

I hereby certify that the accompanying

Transmittal in Duplicate; Specification 12 pages, 7 sheets of drawings;
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Jiawei Huang

ULTRASONIC SIGNALING INTERACTIVE TOY

CROSS-REFERENCE TO RELATED APPLICATION

5 This application claims the priority benefit of Taiwan application serial no. 89211572, filed July 5, 2000.

BACKGROUND OF THE INVENTION

Field of Invention

10 The present invention relates to a signaling device for an interactive toy. More particularly, the present invention relates to an ultrasonic signaling interactive toy.

Description of Related Art

15 In the past, most interactive toys communicate with each other using infrared waves, radio frequency waves or by direct wiring. Fig. 1 is a circuit diagram showing a conventional infrared communication system that can be embedded within an interactive toy. The system includes an integrated circuit 10, an infrared receiver 11, an infrared transmitter 12 and an operational circuit 13. As shown in Fig. 1, each interactive toy must have at least 2 different modules including an infrared receiver 11
20 and an infrared transmitter 12 to carry out necessary communications. Consequently, the required circuit is rather complicated resulting in a higher production cost. Similarly, the same problems apply to an interactive toy that works on radio frequency. Furthermore, power consumption of a radio frequency operated interactive toy is higher than an infrared activated interactive toy. On the other hand, using direct wiring to
25 link up interactive toys is rather inflexible and inconvenient.

SUMMARY OF THE INVENTION

Accordingly, one object of the present invention is to provide an interactive toy that uses ultrasonic as a signal transmission medium for short distance communication, thereby simplifying the required circuit.

5 To achieve these and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, the invention provides an ultrasonic signaling device to be used inside an interactive toy. The device includes an ultrasonic transceiver capable of transmitting and receiving ultrasonic signals. There is at least one ultrasonic transceiver inside each interactive toy for receiving an
10 ultrasonic signal and acting out a response. Response from the interactive toy includes a sound, an image or other outputs produced due to a series of actions. Sound can be emitted from a loudspeaker or a buzzer. An image can be output from a display device and the image can be changed upon receiving new data via ultrasonic signaling. Furthermore, each ultrasonic signal may be designed to include a variety of signaling
15 components so that a plurality of interactive toys may be activated to produce different responses simultaneously. Moreover, the ultrasonic signal may be digitally modulated to lower cost.

In addition, the receiving circuit of the ultrasonic transceiver may further include an interval sampling circuit for sampling ultrasonic signal at a fixed interval. When a
20 sample includes an ultrasonic signal, a corresponding digital signal is output. On the other hand, when no ultrasonic signal is buried in a sample, a reverse-phase digital signal is output. The receiving circuit of the ultrasonic transceiver may further includes an envelope-detection circuit for converting a received ultrasonic signal back to an original digital signal just before modulation.

Because ultrasonic wave is used as a medium of signal transmission in this invention, production cost is considerably lower than devices that operate on infrared or radio frequency and yet without the inconvenience of using direct wiring. In addition, since the transceiver unit is capable of both receiving and transmitting ultrasonic signals, the circuit is very much simplified and production cost is further reduced.

It is to be understood that both the foregoing general description and the following detailed description are exemplary, and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings are included to provide a further understanding of the invention, and are incorporated in and constitute a part of this specification. The drawings illustrate embodiments of the invention and, together with the description, serve to explain the principles of the invention. In the drawings,

Fig. 1 is a circuit diagram showing a conventional infrared communication system that can be embedded within an interactive toy;

Fig. 2A is a sketch showing a group of interactive toys communicating with each other through ultrasonic signals according to a first embodiment of this invention;

Fig. 2B is a sketch showing a group of interactive toys communicating with each other through ultrasonic signals according to a second embodiment of this invention;

Fig. 3 is a diagram showing the manner in which ultrasonic signals are transmitted from a transmitting terminal inside an interactive toy according to the aforementioned embodiments;

Fig. 4A is a diagram showing a first method of implementing an ultrasonic receiver for receiving ultrasonic signals inside an interactive toy;

Fig. 4B is a diagram showing a second method of implementing an ultrasonic receiver for receiving ultrasonic signals inside an interactive toy; and

5 Fig. 5 is a block diagram showing interactive toys of this invention communicating with each other using ultrasonic signals with each interactive toys using a common ultrasonic energy converter as transmitter and receiver.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

10 Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers are used in the drawings and the description to refer to the same or like parts.

15 The interactive toys in this invention use ultrasonic as their mutual transmission medium. Differences and useful range between ultrasonic and other conventional transmission media such as infrared and radio wave are listed out in Table No. 1 and Table No. 2 for comparison.

Table No. 1: Benefits and drawbacks between RF, IR and Ultrasonic

	Benefits	Drawbacks
Radio Frequency (RF)	Longest transmission distance.	1. Transmitter and receiver must be implemented using separate modules so is technically more difficult. 2. Production cost is highest.

Infrared (IR)	Intermediate transmission distance.	<ol style="list-style-type: none"> 1. Transmitter and receiver must be implemented using separate modules in addition to directional problems. 2. Production cost is intermediate.
Ultrasonic	Shorter transmission distance.	<ol style="list-style-type: none"> 1. Transmitter and receiver can be implemented using the same module. 2. Directional problem can be resolved by adjusting transmission power. 3. Production cost is lowest.

Table No. 2: Frequency range between RF, IR and Ultrasonic

Radio Frequency (RF)	150 Mhz ~ 450 Mhz
Infrared (IR)	800 ~ 40000 Ghz
Ultrasonic	20 ~ hundreds Khz

Since interactive toys, in general, are positioned closed to each other, shortness of communicating distance of ultrasonic is not too big of a defect. The benefits of using ultrasonic, however, are overwhelming. Directionality problems can be resolved by adjusting the power rating of the ultrasonic. The most important aspect is the capacity for integrating transmitter and receiver together in the same module, thereby reducing production cost considerably.

The ultrasonic signaling interactive toy of this invention includes an ultrasonic transceiver buried inside an interactive toy. The transceiver is capable of transmitting and receiving ultrasonic signals. Each interactive toy must have at least one ultrasonic transceiver so that the toy can output a response after receiving an ultrasonic signal.

5 Fig. 2A is a sketch showing a group of interactive toys communicating with each other through ultrasonic signals according to a first embodiment of this invention. Altogether 3 interactive toys 20, 22, 24 are shown in Fig. 2A. Each interactive toy has at least one ultrasonic transceiver. To initiate interaction between the toys, an audible sound (for example, a loudspeaker or a buzzer is used to pronounce "My name is
10 Albert") is emitted together with an ultrasonic signal. The ultrasonic signal may include a plurality of target signals 26 and 28 each having a frequency targeting one of the interactive toys 22 and 24. Hence, several toys may be activated to produce corresponding responses. In addition, if a plurality of interactive toys uses the same ultrasonic frequency, the interactive toys receiving the target signals may function
15 according to the content carried. For example, the interactive toy 22 emits the sound "My name is Joe" after receiving the ultrasonic signal 26 and the interactive toy 24 emits the sound "My name is Kevin" after receiving the ultrasonic signal 28. Similarly, the interactive toys 22 and 24 output a plurality of target signals 30, 32, 34 and 36 respectively.

20 Fig. 2B is a sketch showing a group of interactive toys communicating with each other through ultrasonic signals according to a second embodiment of this invention. As shown in Fig. 2B, both interactive toys 40 and 42 are able to display an image on their respective display devices 44 and 46. Moreover, the images may be changed after ultrasonic signals 48 and 50 are received by the receiving device inside each

interactive toy. This type of design is most common in toys that simulate two persons having a competition. Furthermore, some actions may also be incorporated into each interactive toy in response to the ultrasonic signal received.

Fig. 3 is a diagram showing the manner in which ultrasonic signals are transmitted from a transmitting terminal inside an interactive toy according to the
 5 aforementioned embodiments. The transmitting terminal is a device comprising an ultrasonic carrier signal generator 52 and an ultrasonic energy converter 54. The transmitting terminal is capable of transmitting digitally modulated signals. If each
 10 signal transmission session is t and the data switch is "ON" during this session, a carrier signal is introduced into the ultrasonic energy converter 54 to produce ultrasonic signals. On the other hand, if the data switch is "OFF" during this session, the transmission of
 ultrasonic signals is terminated. In this embodiment, digital signal modulation is used for controlling the transmission of ultrasonic signals. However, ultrasonic
 15 transmission can also be controlled by other methods including analogue signaling strength or length of signaling period.

Fig. 4A is a diagram showing a first method of implementing an ultrasonic receiver for receiving ultrasonic signals inside an interactive toy. Aside from the ultrasonic energy converter 56, Fig. 4A further includes an amplifier circuit 58 and a
 20 fixed interval sampling circuit 60. The amplifier circuit 58 amplifies the signals from the ultrasonic energy converter 56. The sampling circuit 60 samples from the ultrasonic signal at each fixed interval. If the sample contains an ultrasonic signal, a digital signal (such as '1') is issued. On the other hand, if the sample does not contain an ultrasonic signal, a reverse-phase digital signal (such as '0') is issued.

Fig. 4B is a diagram showing a second method of implementing an ultrasonic receiver for receiving ultrasonic signals inside an interactive toy. Aside from the ultrasonic energy converter 62, Fig. 4B further includes an amplifier circuit 64 and an envelope-detection circuit 66. The amplifier circuit 64 amplifies the signals from the ultrasonic energy converter 62. The envelope-detection circuit 66 converts the received ultrasonic signal back to the original digital signal before modulation. If the output from the inspection circuit 66 contains an ultrasonic signal, a digital signal (such as '1') is issued. On the other hand, if the output from the inspection circuit 66 does not contain an ultrasonic signal, a reverse-phase digital signal (such as '0') is issued.

Fig. 5 is a block diagram showing interactive toys of this invention communicating with each other using ultrasonic signals with each interactive toys using a common ultrasonic energy converter. Since signaling time is rather short, there is no need to transmit and receive ultrasonic signals at the same time because slightly out of synch signals can hardly be noticed. As shown in Fig. 5, the ultrasonic transceiver 69 on the left side includes an ultrasonic energy converter 70, an ultrasonic signal receiving circuit 72 and a circuit 74 for transmitting ultrasonic carrier waves. Similarly, the ultrasonic transceiver 75 on the right side includes an ultrasonic energy converter 76, an ultrasonic signal receiving circuit 78 and a circuit 80 for transmitting ultrasonic carrier waves. Consequently, the combination of an ultrasonic energy converter with an ultrasonic signaling circuit and a circuit capable of transmitting ultrasonic carrier wave can eliminate a separate transmitter and receiver in infrared and radio wave devices.

In brief, the ultrasonic signaling interactive toy of this invention uses the same circuit module for transmitting and receiving signals. Hence, power consumption and production costs are reduced.

Obviously, minor alterations can also be incorporated into the design of the ultrasonic signaling interactive toy of this invention for improved performance. For example, the ultrasonic transceiver can include two ultrasonic energy converters that integrate with the receiving circuit and the circuit for transmitting ultrasonic carrier
5 wave to form an ultrasonic receiver and an ultrasonic transmitter. Although one more ultrasonic energy converter is required, positioning of the transmitter and receiver is more flexible in addition to the capacity for simultaneous transmission and reception of ultrasonic signals.

It will be apparent to those skilled in the art that various modifications and
10 variations can be made to the structure of the present invention without departing from the scope or spirit of the invention. In view of the foregoing, it is intended that the present invention cover modifications and variations of this invention provided they fall within the scope of the following claims and their equivalents.

WHAT IS CLAIMED IS:

1. An ultrasonic signaling interactive toy, comprising:
an ultrasonic transceiver for transmitting and receiving ultrasonic signals; and
5 an interactive toy having at least one internal transceiver capable of producing a response after receiving an ultrasonic signal.
2. The interactive toy of claim 1, wherein the response is audible sound.
3. The interactive toy of claim 2, wherein the audible sound output is generated by a loudspeaker.
- 10 4. The interactive toy of claim 2, wherein the audible sound output is generated by a buzzer.
5. The interactive toy of claim 1, wherein the response is an image output.
6. The interactive toy of claim 5, wherein the image output is displayed on a display device.
- 15 7. The interactive toy of claim 1, wherein the response is the production of some motion.
8. The interactive toy of claim 1, wherein the ultrasonic signal includes a plurality of target messages for informing a plurality of interaction toys at the same time so that each interactive toy can produce a corresponding response.
- 20 9. The interactive toy of claim 1, wherein the ultrasonic signal includes digitally modulated signal.
10. The interactive toy of claim 1, wherein the ultrasonic transceiver further includes a fixed interval sampling circuit for receiving the ultrasonic signal and sampling at fixed intervals so that a corresponding digital signal is output when the

sample contains an ultrasonic signal and a reverse-phase digital signal is output when the sample does not contain an ultrasonic signal.

11. The interactive toy of claim 1, wherein the ultrasonic transceiver further includes a wave inspection circuit for receiving the ultrasonic signal and converting the
- 5 ultrasonic signal back to the original digital signal before signal modulation.

12. The interactive toy of claim 1, wherein the interactive toy further includes an ultrasonic energy converter for transmitting and receiving ultrasonic signals at different times.

ABSTRACT OF THE DISCLOSURE

An ultrasonic signaling interactive toy comprising of at least one ultrasonic transceiver inside an interactive toy. The ultrasonic transceiver is capable of transmitting and receiving ultrasonic signals. Each interactive toy includes at least one
5 ultrasonic transceiver for producing a response after receiving an ultrasonic signal. Since ultrasonic signals can be transmitted or received using the same circuit, power consumption and production costs are low.

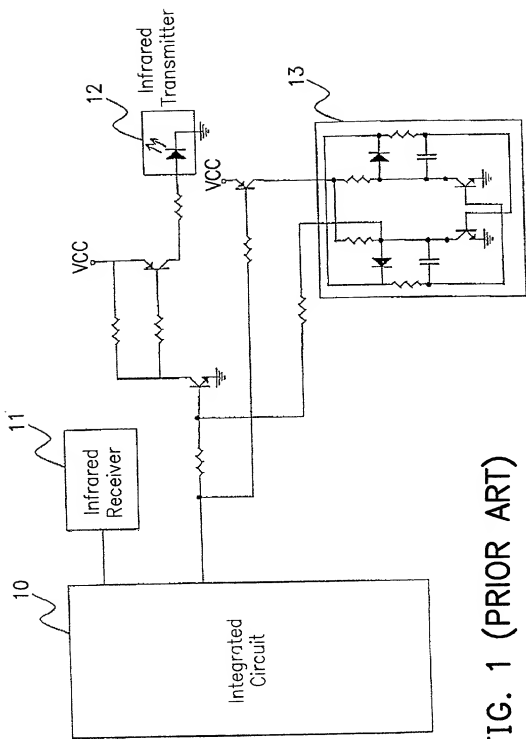


FIG. 1 (PRIOR ART)

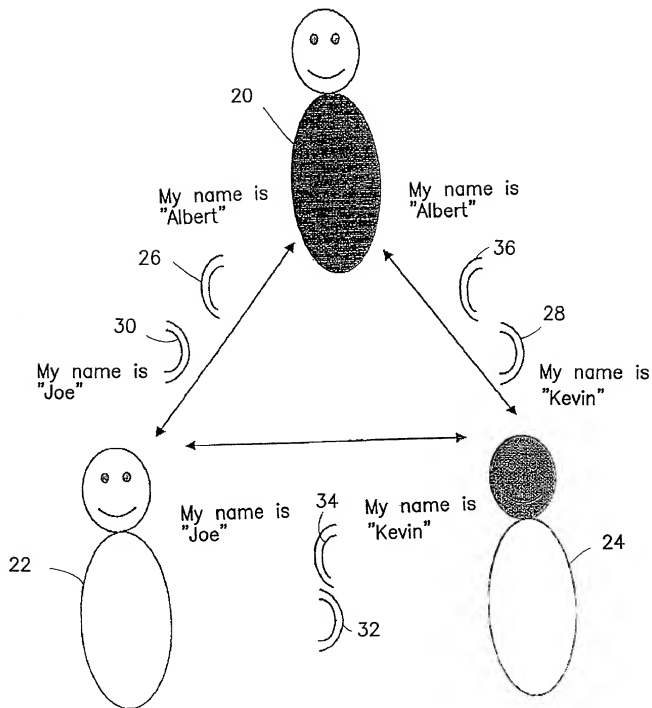


FIG. 2A

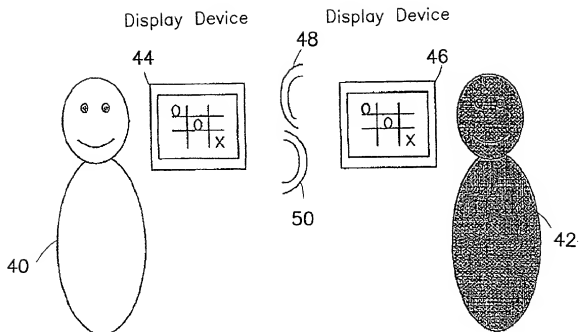


FIG. 2B

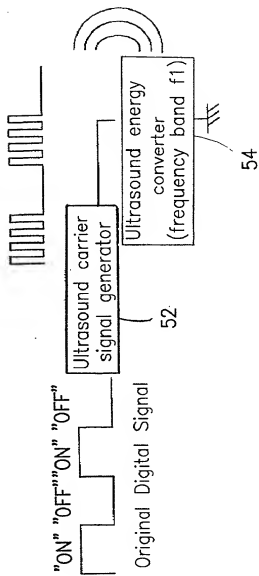


FIG. 3

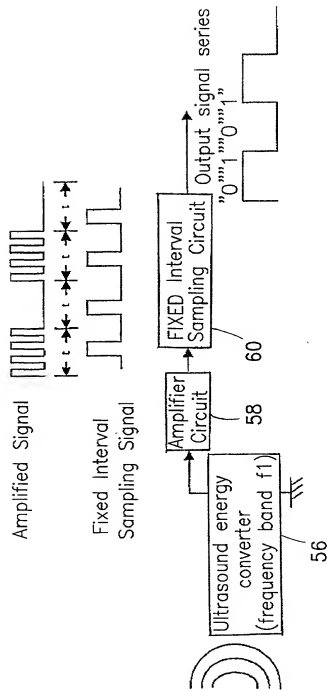


FIG. 4A

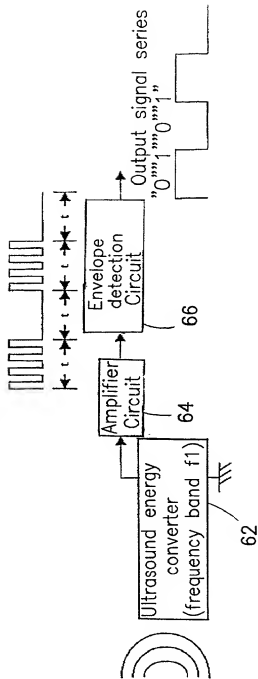


FIG. 4B

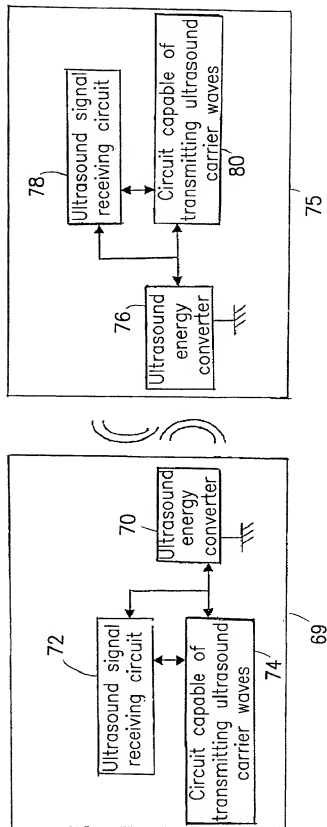


FIG. 5

COMBINED DECLARATION AND POWER OF ATTORNEY

As the below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name and that I believe I am an original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

ULTRASONIC SIGNALING INTERACTIVE TOY

the specification of which

X is attached hereto.

_____ was filed on _____

as Application Serial No. _____ and was amended on _____.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, § 1.56(a).

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Prior Foreign Application(s):

Number	Country	Date Filed(yyyy/mm/dd)	Yes	No
89211572	Taiwan, R.O.C.	2000/7/5	X	

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

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